What is claimed is:

1. An amplifier system comprising:

a power amplifier operative to amplify an input signal, the power amplifier having an input terminal and a supply terminal; and

a mode selector that controls the operation of the amplifier system between an envelope tracking mode, a polar mode and a linear mode by providing a selected amplifier input to the input terminal and a selected amplifier supply signal to the supply terminal based on a characteristic of the input signal.

2. The system of claim 1, the amplifier system operates in the linear mode for low level signals, the polar mode for peak level signals, and in the envelope tracking mode for signals between low level signals and peak level signals.

3. The system of claim 1, the mode selector provides:

a composite signal component to the input terminal and a substantially constant envelope signal component to the supply terminal during linear mode operation;

a composite signal component to the input terminal and a variable amplitude signal to the supply terminal during the envelope tracking mode operation; and

a phase modulated signal component of the input signal to the input terminal and an amplitude modulated signal component of the input signal to the supply terminal during polar mode operation.

4. The system of claim 1, the mode selector having a first output coupled to the input terminal through a first digital-to-analog converter (DAC) and a second output coupled to the supply terminal through a second DAC and a modulation amplifier, the mode selector transmits digital representations of an amplifier input terminal signal and an amplifier supply terminal signal to the first and second DACs, respectively, which convert the digital representations into analog signals.

5. The system of claim 4, at least one of the first and second DACs comprising a delta-sigma DAC, such that the digital representations of at least one of the amplifier input signal component and the supply signal component are converted into the analog domain directly at a desired radio transmission frequency.

6. The system of claim 1, further comprising a predistortion component that modifies at least one of a signal to the input terminal and the supply terminal in the digital domain to mitigate output distortion of the power amplifier.

7. The system of claim 1, further comprising a digital cross-cancellation component that generates a reference signal corresponding to a desired output signal of the amplifier system, the reference signal being combined with a portion of an output signal from the power amplifier to determine an error signal, the error signal being inverted and combined with a delayed version of the output signal of the power amplifier to generate a final output signal.

8. The system of claim 1, further comprising a predistortion component that modifies at least one of a signal to the input terminal and the supply terminal in the digital domain to mitigate output distortion of the power amplifier and a digital cross-cancellation component that generates a reference signal corresponding to a desired output signal of the amplifier system, the reference signal being combined with a portion of an output signal from the power amplifier to determine an error signal, the error signal being inverted and combined with a delayed version of the output signal of the power amplifier to generate a final output signal.

9. The system of claim 8, the reference signal being provided to a delta sigma digital-to-analog converter (DAC) to convert the reference signal from the digital domain to the analog domain directly to a desired radio transmission frequency.

10. The system of claim 8, further comprising a peak-to-average reduction (PAR) component that clips and/or removes peaks signals from the input signal, the

digital cross-cancellation component providing corrective signals to the final output signal.

11. The system of claim 1, further comprising a feedback path to compensate for variations in age and temperature of the amplifier system.

12. A transmitter comprising the amplifier system of claim 1.

13. A base station comprising the transmitter of claim 11.

14. The system of claim 1, the mode selector operative to delay the amplifier input and the supply signal in the envelope tracking mode to generate a supply signal with an acceptable headroom.

15. An amplifier system comprising:

a power amplifier;

a modulation amplifier having an output coupled to a supply terminal of the power amplifier;

a first digital-to-analog converter (DAC) coupled to an input terminal of the power amplifier;

a second DAC coupled to an input terminal of the modulation amplifier; and

a digital system having a first output coupled to an input of the first DAC and a second output coupled to the input of the second DAC, the digital system controls the operation of the amplifier system between an envelope tracking mode, a polar mode and a linear mode based on an amplitude level of an input signal, the amplifier system operates in the linear mode for low amplitude level input signals below about a first threshold level, the polar mode for peak level input signals above about a second threshold level, and in the envelope tracking mode for signals between about the first threshold level and the second threshold level.

16. The system of claim 15, the digital system provides:

a composite component of the input signal to the input terminal of the power amplifier and a substantially constant amplitude signal to the supply terminal of the power amplifier during the linear mode;

a phase modulated component of an input signal to the input terminal of the power amplifier and an amplitude modulated component of the input signal to the supply terminal during the polar mode; and

a composite component of the input signal to the input terminal of the power amplifier and a variable amplitude signal to the supply terminal of the power amplifier during the envelope tracking mode.

17. The system of claim 16, the variable amplitude signal to the supply terminal during the envelope tracking mode operation being an amplitude modulated component of the input signal plus a headroom amplitude that is a function of one of time and input power.

18. The system of claim 16, at least one of the first and second DACs converting digital signals into the analog domain directly at a desired radio transmission frequency.

19. The system of claim 16, further comprising at least one of a predistortion component that modifies signals provided to the power amplifier to mitigate output distortion of the power amplifier, and a digital cross-cancellation component that generates a reference signal corresponding to a desired output signal of the amplifier system, the reference signal being combined with a portion of an output signal from the power amplifier to determine an error signal, the error signal being inverted and combined with a delayed version of the output signal of the power amplifier to generate a final output signal.

20. An amplifier system comprising:

means for amplifying a phase and/or amplitude modulated input signal; and

means for switching modes of operation of the amplifier system between an envelope tracking mode, a polar mode and a linear mode based on an amplitude level of the input signal relative to a first threshold level and a second threshold level, the amplifier system operates in the linear mode for input signal amplitudes below about the first threshold level, the polar mode for input signal amplitudes above about the second threshold level, and in the envelope tracking mode for input signal amplitudes between about the first threshold level and about the second threshold level.

21. The system of claim 20, further comprising means for converting the input signal into a polar representation of the input signal, the polar representation comprising a composite signal component having an amplitude modulated component and a phase modulated component, the amplitude modulated component supplying the means for amplifying and the phase modulated component being amplified by the means for amplifying during the polar mode, the means for amplifying being supplied by a constant amplitude signal and the composite signal component being amplified by the means for amplifying in the linear mode, and the means for amplifying being supplied by a variable amplitude voltage above the amplitude modulated component and the composite signal be amplified by the means for amplifying in the envelope tracking mode.

22. The system of claim 20, further comprising means for converting at least a portion of the input signal from the digital domain to the analog domain directly to a desired radio transmission frequency.

23. The system of claim 20, further comprising means for modifying the input signal and means for modifying the output signal to facilitate amplifier system efficiency and mitigate out-of-band emissions.

24. A method of amplifying an input signal with a power amplifier, the method comprising:

switching modes of operation of the power amplifier between envelope tracking mode, polar mode and linear mode based on a characteristic of the input signal relative to a first threshold level and a second threshold level;

transmitting a composite signal to the input terminal and a variable amplitude signal with a headroom amplitude that ensures the amplifier is not significantly in the gain compression region during envelope tracking mode operation, transmitting a phase modulated component of the input signal to an input terminal of a power amplifier and an amplitude modulated component of the input signal to a supply terminal of the power amplifier during polar mode operation, and transmitting a composite signal to the input terminal and a constant amplitude component to the supply terminal during linear mode operation; and

amplifying the input signal *via* the power amplifier.

25. The method of claim 24, further comprising transmitting the amplified input signal to at least one receiver.

26. The method of claim 24, further comprising converting at least a portion of the input signal from the digital domain to the analog domain directly to a desired radio transmission frequency prior to providing at least a portion of the input signal to the power amplifier.

27. The method of claim 24, further comprising at least one of modifying the input signal and modifying the output signal to facilitate the efficiency and mitigate out-of-band (OOB) emissions of the power amplifier.

28. The method of claim 24, the first threshold level being an envelope amplitude level that corresponds to low level amplifier signals and the second threshold being an envelope amplitude level that corresponds to peak level amplifier signals.